

# PATENT SPECIFICATION

## DRAWINGS ATTACHED

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### **Improvements in apparatus for observing and measuring of pressures within organs of the human body.**

#### **COMPLETE SPECIFICATION**

We, AKTIEBOLAGET VACUUM-EXTRACTOR, of 13 Drottninggatan, Gothenburg, Sweden, a Company registered under the laws of Sweden, do hereby declare the invention, for which we pray that a patent may be granted to us, and a method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to certain novel improvements in apparatus for observing and measuring of pressures within organs of the human body.

It is of great value for the medical treatment of the human body to be able to state and measure pressures within organs of the body for instance the pressures which are causing the pain during childbirths.

The main object of the invention is to provide a device for the said purpose which is able to work in pressing position on the organ without piercing the covering thereof.

Another object of the invention is to provide a device for the said purpose which is able at childbirths to work in pressing position directly on the skin without causing any injury.

A further object of the invention is to provide a device for the said purpose which is able at childbirths to work in position on the child's head.

A further object of the invention is to provide a device for said purpose which is able to measure and register the pressure variations within human organs.

With these and further objects in view the invention consists in an apparatus having a pressure plate with a preferably smooth under surface adapted to be pressed against the organ, the plate being provided with a chamber with connection means for a pressure medium source preferably compressed air and connection means for a pressure measuring instrument, the chamber opening out through the under surface and being provided with a separate outlet, the inner mouth

of the outlet lying in the opening substantially in the plane of the under surface.

The invention will be best understood by reference to the accompanying drawing showing a preferred construction exemplified to be used at childbirths, and in which:

Figure 1 is a longitudinal sectional view of the apparatus in one embodiment, and

Figure 2 a diagrammatical view of the apparatus in coaction with additional equipment for carrying out the pressure measuring function.

Figure 3 is a longitudinal section of a further embodiment of the apparatus and

Figure 4 the apparatus of Fig. 3 in a smaller scale and in combination with a suction cup intended to form part of releasing apparatus at childbirths.

Figure 5 is a pressure diagram registered during the use of the apparatus at a childbirth.

The apparatus consists of a pressure plate 1 suitably of circular shape. The pressure plate has a smooth under surface 1b and is provided with a cuplike chamber 2 opening out through the under surface which chamber is intended to be filled up with a pressure medium preferably compressed air. The chamber is provided with an inlet 3 and an outlet 4 for the compressed air and with connection means 3a, 4a for additional pipings. The opening of the chamber is in the shown embodiments covered by a membrane 5 of springy and elastic material such as rubber or the like. The membrane lying close to the under surface may be held in position in any suitable way for instance by rubber band 7 (Fig. 1) or by an annular plate 8 (Fig. 3) after being folded around the outer flange edges 6 of the pressure plate. The mouth of the outlet 4 into the chamber 2 is in engagement with the membrane and lies at the free lower end of a protrusion 10 from the ceiling 9 of the chamber, and the outlet mouth is positioned in the same plane as the under

(Price 3s. 6d.)

surface so that the membrane will normally close the outlet mouth. The end surface of the protrusion is suitably curved towards the mouth opening as seen in the Figures 1 and

5 3.

In the embodiment of Figure 1 the apparatus is provided at the upper surface with a central grip 11 through which the outlet 4 opens out, and by which the apparatus may be pressed with the membrane against the

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stomach skin of the childbirth patient and be retained in position in a simple way for instance by means of an adhesive plaster. In use the air inlet 3 is to be connected by a pipe 3b with a source of compressed air for instance an air container 21. The air pipe has close to the air container and a shut-off valve 22 and is here also provided with a narrow passage for instance in the shape of a nozzle 23 or a needle valve, so that the air will stream through in a thin jet when the shut-off valve is open. An air pressure meter 24 is inserted in the piping and for an automatic registering of the pressure variations it is suitable to connect a corresponding apparatus for instance a barograph 25 which in known manner draws a pressure curve on a registering band.

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The embodiment of the apparatus shown in Figures 3 and 4 is combined with a suction cup 12, the latter having a central tube stud 13 for a rubber hose to be connected to a vacuum pump not shown in order to obtain reduced pressure within the cup. This suction cup is intended to be placed with the suction opening 14 against a child's head during the childbirth to adhere to the scalp of the head to permit the head to be subjected to a drawing force facilitating the childbirth. The suction cup is in this case preferably of stiff material as for instance metal and resembling U.S. Patent 2,702,038 in that it has a narrowed suction mouth with the cup walls directed outwards from the mouth. On account thereof the scalp 15 of the child's head, sucked into the cup under influence of the reduced air pressure, will fold outwards around the edges of the cup mouth to take the shape of a widened bladder the tightening pressure against the mouth edges contributing to a strong adhering of the cup to the scalp. The pressure measuring apparatus is positioned at the bottom 12a of the suction cup with tube studs 3b, 4a reaching through the bottom wall and secured by outer nuts 16, air-tightness being obtained by plates 17 of rubber or such like between the cup bottom and the apparatus. Between the outer edge of the apparatus and the cup wall is a space 18 serving as a passage for the air suction to the interior of the cup, and the scalp sucked into the cup will come to lie close to the membrane of the apparatus. The apparatus has a central hook 19 opposite the central tube stud 13

and a chain 20 is connected to the hook and drawn through the stud to serve as a draw grip during the use of the suction cup. Safety-holes 30 are indicated on the pressure apparatus as a way out for the air if the pressure is too high.

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In use the apparatus is placed on the stomach skin of the patient or when combined with the suction cup on the head of the child during the childbirth. Figure 5 is a recorded example of the latter case. The compressed air is passed through the valve 22 and streams through the nozzle 23 to the chamber 2 to increase the pressure in this chamber and thereafter to pass out through the outlet mouth 4 as soon as the pressure within the chamber reaches and will rise above the pressure of the patient's skin against the membrane. As long as the pressure of the skin is constant the registering band shows a horizontal pressure line. If pain is arising on account of the increasing muscle pressure the membrane is pressed against the outlet mouth by the skin and the passage of the air is stopped thereby until the pressure within the chamber is raised to the same pressure as the skin pressure and then the air will again begin to pass out between the membrane and the outlet. The new pressure will be registered on the band as a downwardly directed peak. As the pain at a birth is produced by a number of pressure pushes interrupted by relaxing movements the result on the register band indicated in Figure 5 will show up as a number of peaks connected by zero-lines, the latter referred to a time-scale 27 will indicate the time between moments of pain. If the drum for the band is driven by clockwork as usually is the case, the time periods between the moments of pain will be exactly indicated. The shorter peaks 26a on the register band show the muscle pressures on a scale 28 during the moments of pain. At 26b a drawing force has commenced to be intermittently applied to the suction cup increasing the height of the pressure peaks, and from the point 26c the drawing force is used for every moment of pain. Shortly thereafter the expulsion has taken place.

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By the registering with the pressure measuring apparatus it is possible to state the degree of difficulty at the childbirth and to use the help of the suction cup at right time. Therein lies also the advantage of the combination of the pressure measuring apparatus with the suction cup. It has been stated that the pressure registering in the manner explained above is sensitive in such a degree that the beginning of a pain period is possible to be observed before the patient herself become aware thereof, and this will facilitate the use of the suction cup at the right time.

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The invention is not limited to the use 130

solely for childbirths but may be available for pressure testing of other human organs directly accessible or lying within the human body which are covered by skin, cuticles, pellicles and such like. As example may be mentioned the human eye where certain tensions are able to be measured by the apparatus.

As the human skin or an organ covering is in itself of elastic nature it is also possible to use the apparatus without an artificial membrane in which case the human skin or the organ covering itself serves as membrane when the apparatus is pressed thereupon. This is the most simplified embodiment of the apparatus and this is possible as the inner mouth of the air outlet lies in the same plane as the under surface of the apparatus. If an artificial membrane is used the under surface of the pressure plate must be straight but in the other case the under surface may be curved if desired.

#### WHAT WE CLAIM IS:

1. An apparatus for observing and measuring pressures within closed human organs, for instance the womb, consisting of a pressure plate having an under surface adapted to be pressed against the organ, the plate being provided with a chamber with an inlet with connection means for a pipe to a pressure medium source, preferably compressed air, and connection means for a pressure measuring instrument, the chamber opening out through the under surface and being provided with a separate outlet, the inner mouth of the outlet lying in the opening of the chamber, said opening being covered by an elastic membrane which also covered the mouth of the outlet.

2. An apparatus according to claim 1 characterized in that the pressure measuring instrument is a pressure registering apparatus for instance a Barograph registering the pressure in the inlet pipe corresponding to that pressure in the chamber which is able to force the membrane away from the mouth of the outlet.

3. An apparatus according to claim 1 characterized in that the inlet pipe is provided with a throttling device such as a throt-

led portion of the pipe, a needle valve or such like.

4. An apparatus according to claim 1, 2 or 3, characterized in that it is combined with a suction cup serving as a releasing device for childbirths for attachment to the child's head, the apparatus being placed within the suction cup with the membrane opposing the suction mouth of the cup.

5. An apparatus combined with a suction cup according to claim 4, characterized in that the apparatus, positioned in the upper portion of the suction cup where the latter has a connection for a suction source, leaves a space at the inner surface of the cup wall for the transmission of the suction effect along said wall to the suction mouth of the cup.

6. An apparatus according to claim 4 or 5, characterized in that the suction cup, preferably of stiff material, has a narrowed suction mouth surrounded by a wall portion which is curved outwards in such a way that a sucked-in portion of the head scalp will form a laterally effectively widened bladder, which in pressing against the membrane will press this against the outlet mouth in the apparatus.

7. A modification of the apparatus according to claim 1, characterized in that the human skin serves in itself as membrane for the apparatus.

8. An apparatus substantially as hereinbefore described and as shown in the accompanying drawing.

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**This drawing is a reproduction of the Original on a reduced scale.**

